

the northern coast of the Gulf of Finland, seven miles distant from the sea-shore) is explained by the increase of the rate of upheaval of the country towards the north. This old lake, like Lake Ladoga of our days, seems to have had but a poor fauna. Many smaller lakes which covered Esthonia, had a peculiar freshwater fauna. Gravel and sand, with *Ancylus fluviatilis*, like that found in Lake Baykal, and *Lymnaeus ovatus*, as also *Neritina fluviatilis*, *Paludina impura*, *Unio*, and *Cyclas* are found at heights varying from 50 to 150 feet above the actual sea-level. On (Esel these deposits are widely spread, and descend to a level of 20 feet above the sea. At a still later period the lakes were filled with ooze, which constitutes now the so-called "marl of prairies" (*Wiesenmergel*) filled up with *Planorbis*, *Lymnaeus*, &c., and containing also remains of man, together with bones of reindeer, as described by Prof. Grewingk.

In connection with this subject reference may be made to the conclusions arrived at as to the glacial formations by M. Nikitin, while making the geological survey within the limits of sheet 58 of the geological map of Russia, comprising Yaroslavl and the eastern parts of Novgorod and Tver. The features of the Till, or Boulder-clay, which covers this region, are so much at variance with the theory of floating ice, which has been proposed to explain them, as well as with every other aqueous theory, and so much in conformity with the idea of a bottom moraine, that M. Nikitin has been compelled to admit the former extension of the northern ice-sheet of the Glacial period throughout the region of the Upper Volga (vol. ii. fasc. 3). The Boulder-clay of the Government of Poltava, sometimes 20 m. thick, consists of triturated, unstratified materials, partly derived from sources within the region itself, and partly brought from the north. It contains scratched boulders, and though undoubtedly of glacial origin, its precise mode of formation still remains in dispute, notwithstanding the careful attention given to the study of the question by M. Armashovsky (vol. ii. fasc. 6).

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

CAMBRIDGE.—The Natural Sciences Tripos, Part I., commenced on May 17; Part II. will commence on May 29.

The examiners in the Mathematical Tripos of 1883-84 have reported that the work done in Part II. was on the whole disappointing, and inferior to that usually done in the old "five-days" examination. They suggest that this may be due to its taking place in the Easter Term, in which revision of subjects is usually much interrupted. In Part III. eleven candidates presented themselves, of whom seven were placed in the first division. The work was extremely good, the candidates having judiciously specialised their reading.

SCIENTIFIC SERIALS

Bulletin de l'Académie Royale de Belgique, February 2.—On the crepuscular phenomena of the months of November and December 1883, by F. Terby.—On the physiological action of aspidospermine (bark of *Aspidosperma quebracho*), by Dr. Closson.—Remarks on some Sanskrit verbal roots of the eighth class, by J. van den Gheyn.—Contributions to the biography of the portrait painter A. de Vries, and of the Flemish painter Theodora van Loon, by Auguste Castan.—Biographical notice of the Dutch painter Marin van Romerswael, by Henry Hymans.

March 1.—Note on the Pons-Brooks comet 1812, observed at Louvain during the winter of 1883-84, by F. Terby, and at Brussels by L. Niesten.—On an empirical relation between the coefficient of internal friction of liquids, and its variations under changes of temperature, by P. de Heen.—Preliminary communication on the anatomy of the Acarians, a group of Arachnidæ, by J. MacLeod.—On the changes of refrangibility in the electrical spectra of hydrogen and magnesium, by Ch. Fievez.

Journal of the Russian Chemical and Physical Society, vol. xvi. fasc. i.—The dilatation of liquids, by D. Mendeléeff.—On the tension of vapour of solutions, by D. Konvaloff. The author has resorted in his measurements to a method much like that of Magnus, and gives the results of his measurements (illustrated by curves) for mixtures of water with alcohols and acids: formic, acetic, propionic, and butyric; they

are followed by a discussion on the distillation of solutions, on mixtures, and on the solubility of liquids.—On an acoustic instrument for measuring the number of vibrations, by A. Izraileff.—New demonstrations of the conditions of minimum of deviation of a ray by the prism, by K. Kraevitch. In most treatises on physics this demonstration is made by means of methods more or less artificial, excepting the treatise of Jamin, who has resorted to differential calculus. However long, M. Kraevitch's demonstration is very simple, and is deduced very naturally out of the fundamental laws of refraction.—On the friction of well lubricated bodies, by N. Petroff.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, May 8.—"On a Relation between the Coefficient of the Thomson Effect and certain other Physical Properties of Metals." By Shelford Bidwell, M.A., LL.B.

Having observed that the coefficient of the Thomson effect is generally positive in those metals which have a great specific resistance and specific heat, and negative in those which are distinguished by a great coefficient of expansion, the author endeavoured to find an empirical formula expressing the coefficient of the Thomson effect in terms of the specific resistance, specific heat, and coefficient of expansion. Though he was not altogether successful, he believes that the subjoined table points to a close relation between them.

I.	II.	III.	IV.
Metals	Coefficient of Thomson effect.	$H \times R - E^2$	Last column divided by 2400
Ni ...	5.12 ...	12320 ...	5.13
Fe ...	4.87 ...	9918 ...	4.13
Pd ...	3.59 ...	7086 ...	2.95
Pt (soft) ...	1.10 ...	2309 ...	0.96
Pt (hard) ...	0.75 ...	— ...	—
Mg ...	0.95 ...	1384 ...	0.58
Pb ...	0 ...	— 604 ...	— 0.25
Al ...	— 0.39 ...	1942 ...	0.81
Sn ...	— 0.55 ...	— 868 ...	— 0.36
Cu ...	— 0.95 ...	— 1137 ...	— 0.47
Au ...	— 1.02 ...	— 1172 ...	— 0.49
Ag ...	— 1.50 ...	— 2246 ...	— 0.94
Zn ...	— 2.40 ...	— 2355 ...	— 0.98
Cd ...	— 4.29 ...	— 4958 ...	— 2.07

The first column contains the names of the metals, except alloys, given in Tait's thermo-electric diagram (*Trans. R.S.E.*, vol. xxvii. p. 125). The second column gives the coefficients of the Thomson effect: these are taken from Everett's table ("Units and Physical Constants," p. 151), which is based upon Tait's diagram.

H, R, and E being numbers proportional to the specific heats, specific resistances, and coefficients of expansion of the various metals, $H \times R - E^2$ gives the numbers in the third column of the table. H = specific heat $\times 10^3$, R = specific resistance $\times 10^3$, E = coefficient of expansion $\times 10^8 \div 34$. The multipliers 10^3 and 10^8 were used merely for the convenience of getting rid of decimals; the divisor, 34, was so chosen that while the ratio of the first number to the last in Column III. should be as nearly as possible equal to the ratio of the first number to the last in Column II., the number corresponding to lead in Column III. should at the same time be as near zero as possible. Both conditions could not be exactly fulfilled at once. The authorities for the specific heats, specific resistances, and coefficients of expansion are given in the paper.

Column IV. gives the numbers in Column III. divided by 2400, to facilitate comparison with Column I.

It will be seen that with one exception the order of magnitude of the numbers in Column IV. is exactly the same as the order of those in Column II. The rate of decrease is not, however, the same, the numbers diminishing too rapidly in the upper half of Column IV., and too slowly in the lower half.¹

¹ With regard to aluminium it is suggested that Matthiessen's determination of the specific resistance, 0.029, is possibly too high. Moreover the author found experimentally that the Thomson coefficient of the specimen of aluminium which he used was slightly + instead of —, as given in Column II.; it is also shown as + in the diagram at p. 178 of Jenkin's "Electricity." If its specific resistance were as high as 0.026, it would come between magnesium and lead in Column IV.

Geological Society, April 23.—Prof. T. G. Bonney, F.R.S., president, in the chair.—The following communications were read:—On the geology of the country traversed by the Canada Pacific Railway, from Lake Superior to the Rocky Mountains, by Principal J. W. Dawson, C.M.G., F.R.S. This paper recorded observations made by the author with reference to the geology of the North-West Territories of Canada, in an excursion in the summer of 1883, along the line of the Canada Pacific Railway as far as Calgary, at the eastern base of the Rocky Mountains. After referring to the labours of the Canadian Geological Survey, and more especially of Dr. G. M. Dawson, in this region, the author proceeded to notice the Laurentian, Huronian, and other pre-Silurian rocks of the west of Lake Superior and the country between that lake and the Red River. Good exposures of many of these rocks have been made in the railway-cuttings, and important gold-veins have been opened up. The Laurentian rocks present a remarkable uniformity of structure over all the vast territory extending from Labrador to the Winnipeg River, and where they reappear in the mountains of British Columbia. They are also similar to those of South America and of Europe; and there was on the table a collection of Laurentian rocks from Assouan, in Upper Egypt, made by the author in the past winter, which showed the reappearance of the same mineral characters there. In Egypt there is also an overlying crystalline series, corresponding in some respects with the Huronian. The Huronian rocks west of Lake Superior are, however, more crystalline than those of Lake Huron, and may be of greater age. The Palæozoic rocks are exposed in places on the western side of the old crystalline rocks near the Red River, and show a remarkable union and intermixture of Lower and Upper Silurian forms, or rather, perhaps, a transition from the one fauna to the other in a very limited thickness of beds. The collections of Mr. Panton, of Winnipeg, were referred to in this connection. The Cretaceous and Eocene beds of the plains were then noticed, and certain sections showing the coal-bearing series described; and comparisons were instituted between the Cretaceous and Eocene succession in Canada and that in the United States and elsewhere. The Pleistocene drift deposits constitute a conspicuous feature on the western prairies. Along the railway, Laurentian, Huronian, and Palæozoic boulders from the east may be seen all the way to the Rocky Mountains, near which they become mixed with stones from these mountains themselves. The vast amount of this drift from the east and north-east, and the great distance to which it has been carried, as well as the elevation above the sea, are very striking. The great belt of drift known as the Missouri Coteau is one of the most remarkable features of the region. It was described in some detail where crossed by the railway, and it was shown that it must represent the margin of an ice-laden sea, and not a land-moraine, and that its study has furnished a key to the explanation of the drift deposits of the plains, and of the so-called "Terminal Moraine," which has been traced by the geologists of the United States from the Coteau round the basin of the Great Lakes to the Atlantic.—On the Dyas (Permian) and Trias of Central Europe and the true divisional line of these two formations, by the Rev. A. Irving, B.Sc.

Zoological Society, May 6.—Prof. W. H. Flower, F.R.S., president, in the chair.—Prof. Bell exhibited some specimens of *Estheria melitensis* sent from Malta by Capt. Becher, R.A., and stated that, in answer to his inquiries, that gentleman had confirmed the fact of the males appearing to equal in number the females, as had been stated by previous observers of the members of the genus.—Mr. G. A. Boulenger read a paper on the reptiles and Batrachians of the Solomon Islands, principally based upon two collections forwarded to the British Museum from that locality by Mr. H. B. Guppy, R.N.—Lieut.-Col. Godwin-Austen, F.R.S., exhibited an old Indian drawing representing a tiger-hunt; and called attention to the colour of one of the elephants engaged, which was of a creamy white.—Prof. Flower, F.R.S., described the state of dentition of a young Capybara (*Hydrochærus capybara*) born in the Society's Gardens, which had died when eight days old. All the teeth of the permanent series were present and in use.—Prof. F. Jeffrey Bell read a paper on *Amphicyclus*, a new genus of Dendrocinotus Holothurians, and on its bearing on the classification of the suborder.—A communication was read from Mr. Edgar A. Smith, containing a report on the land and freshwater Mollusca which had been collected during the voyage of H.M.S. *Challenger* from December 1872 to May 1876. The collection contained examples of 152 species, some of which were of interest and several new to science.—A

communication was read from Count Berlepsch and M. Taczanowski, containing an account of a second collection of birds made in Western Ecuador by Messrs. Stolzmann and Siemiradzki. There were stated to be examples of 177 species in this collection, which had been made at various localities on the western slope of the Cordilleras above Guayaquil. The following species were described as new:—*Henicorhina hilaris*, *Chlorospingus ochraceus*, and *Spermophila pauper*. A new genus, *Periloricus*, was proposed for *Todirostrum ruficeps* of Kaup.—A paper by Messrs. Godman and Salvin was read, which contained a list of the Rhopalocera obtained by Mr. G. French Angas during a recent visit to the Island of Dominica. The number of species in this collection was twenty-seven, among them being a species of *Nymphalinea* apparently new; this the authors proposed to describe as *Cymatogramma dominicana*.—Mr. Herbert Druce read a paper describing the Heterocera collected by Mr. Angas on the same island.

Victoria Institute, May 6.—Vice-Chancellor Dawson, C.M.G., of McGill University, Montreal, read a paper on prehistoric man in Egypt and Syria, and described the investigations which he had carried on during the winter in Egypt and Syria. Dr. Dawson illustrated his paper by diagrams and specimens, among which were several of the bones of animals, in the classification of which Prof. Boyd Dawkins, F.R.S., had taken part; in dealing with his subject Dr. Dawson remarked that great interest attaches to any remains which, in countries historically so old, may indicate the residence of man before the dawn of history. In Egypt, nodules of flint are very abundant in the Eocene limestones, and where these have been wasted away, remain on the surface. In many places there is good evidence that the flint thus to be found everywhere has been used for the manufacture of flakes, knives, and other implements. These, as is well known, were used for many purposes by the ancient Egyptians, and in modern times gun-flints and strike-lights still continue to be made. The debris of worked flints found on the surface is thus of little value as an indication of any flint-folk preceding the old Egyptians. It would be otherwise if flint implements could be found in the older gravels of the country. Some of these are of Pleistocene age, and belong to a period of partial submergence of the Nile Valley. Flint implements had been alleged to be found in these gravels, but there seemed to be no good evidence to prove that they are other than the chips broken by mechanical violence in the removal of the gravel by torrential action. In the Lebanon, numerous caverns exist. These were divided into two classes, with reference to their origin, some being water-caves or tunnels of subterranean rivers, others sea-caves, excavated by the waves when the country was at a lower level than at present. Both kinds have been occupied by man, and some of them undoubtedly at a time anterior to the Phœnician occupation of the country, and even at a time when the animal inhabitants and geographical features of the region were different from those of the present day. They were thus of various ages, ranging from the post-Glacial or Antediluvian period to the time of the Phœnician occupation. In illustration of this, the caverns at the Pass of Nahr-el-Kelb and at Ant Elias were described in some detail, and also, in connection with these, the occurrence of flint implements on the surface of modern sand-stones at the Cape or Ras near Beyrout. These last were probably of much less antiquity than those of the more ancient caverns.

SYDNEY

Linnean Society of New South Wales, March 26.—C. S. Wilkinson, F.G.S., F.L.S., president, in the chair.—The following papers were read:—On plants which have become naturalised in New South Wales, by the Rev. W. Woolls, Ph.D., F.L.S. In this paper the author not only deals with the various importations, whether intentional or otherwise, of new and often injurious weeds, but also with the general and deliberate destruction of the native flora, especially in timber. He also points out that many of our most valuable trees, as for instance the Myall (*Acacia pendula*), are dying out in consequence of the want of any kind of protection for the young plants. They are produced in abundance, but eaten down as fast as they grow. The paper contains a complete account of all the exotic *Mono-* and *Di-cotyledons* known in the colony.—The Australian *Hydromedusa*, part i., by R. von Lendenfeld, Ph.D. It is proposed in this paper to describe a series of new species of *Hydromedusa* of our shores. A new classification of the *Hydromedusa* is proposed. The present paper forms a

Prodromus of a system of the *Hydroid Zoophytes* and *Craspedote Medusa*, which will be used and marked out in detail in subsequent papers. The order of the *Hydromedusa* is here divided into five sub-orders and twenty-one families.—The *Scyphomedusa* of the Southern Sea, part ii., by R. von Lendenfeld, Ph.D. This paper is a continuation of the paper read at the last meeting of the Society, and contains a description of all the species of the third order of the *Scyphomedusa*, the *Cubomedusa*, which have been described from the South Sea.—On some fossil plants from Dubbo, New South Wales, by the Rev. J. Milne Curran, F.G.S. This paper, which was illustrated by specimens in an extraordinary state of preservation, and mounted for the microscope, is a very careful essay towards the determination of the (so-called) Hawkesbury beds at Dubbo, and names or describes as belonging to that formation the following forms, viz.:—*Sphenopteris crebra*, *S. glossophylla*, *Neuropteris australis*, *Thinfeldia odontopteroides*, *T. media*, *Alethopteris Curranii*, *A. concinna*, *Merianopteris major*, and a Conifer, *Walchia milneana*. Of new species Mr. Curran names *Odontopteris macrophylla*, *Alethopteris (Pecopteris) australis*, *Hymenophyllites dubia*, *Podosamites*, sp., and one Conifer set down doubtfully as *Walchia piniformis*.

BERLIN

Physiological Society, April 18.—Prof. Zuntz, with the help of a diagram, described and explained an apparatus for determining the gaseous inhalation and exhalation in the case of animals affected with curare. Essentially it consisted of two glass bells set by means of an electric motor into regular up-and-down rhythmical movements, alternately sinking into a larger vessel filled with mercury, and rising out of it. Each bell had two connecting-tubes, one communicating with the animal under examination, the other with other parts of the apparatus. One bell was connected with a graduated reservoir containing the air that was to be inhaled, while the second communicated with a bell, likewise graduated and filled with mercury, intended to receive the exhaled air. By means of inserted mercurial valves the path of air was so arranged that in the rising of the bells the first came into communication only with the reservoir, and filled itself with the contents of the same, while the second bell had communication solely with the trachea of the animal, and drew in the air of the lungs. In the sinking of the bells, on the other hand, the first communicated with the trachea, and forced the air that was to be breathed into the lungs, while the second communicated with the reservoir, and emptied into it the air previously exhaled from the lungs. This apparatus kept up the most regular artificial respiration in animals paralysed by curare for any length of time, even for many hours, and enabled, on the one hand, gases that might be exactly measured, and of any composition that might be desired, to be employed for the purpose of respiration; on the other, the products that were exhaled to be collected for measurement and chemical analysis. A whole series of other arrangements connected with this respiratory apparatus, provided automatically for supplying the reservoir with exactly the appointed kind of air and in uniformly identical mixture, as also for producing and conducting to the reservoir, automatically, the requisite quantities of oxygen for determinate experiments.—Dr. Kempner, with the apparatus above described, had, in the laboratory of Prof. Zuntz, instituted measuring experiments on the influence of the proportion of oxygen in the air that was to be inhaled on the consumption of oxygen and the exhalation of carbonic acid from the lungs. It was a universally accepted doctrine that the proportion of oxygen in the air to be inhaled might vary within very wide limits, from between 100 and 15 per cent., without essentially affecting the respiration, and that only when the oxygen sank to 5 per cent. or less did phenomena of suffocation appear. This view, which was based principally on the experiments of Regnault and Reiset, was not, in Dr. Kempner's opinion, sufficiently justified by the experiments referred to. In consequence he some years ago carried out experiments on himself by inhaling, for the space of ten minutes on each occasion, by means of forced inspiration, air of different proportions of oxygen, and then analysing the exhaled air. From these experiments he found that respiration and the consumption of oxygen were not influenced by a higher than the normal proportion of oxygen in the air that was breathed. With a reduction, however, of the oxygen in the air to be inhaled below the normal proportion, the consumption of oxygen became likewise reduced. It might be supposed that this result, which was at variance with the general view on the subject, was

due to the abnormal conditions of respiration and the forced inspiration. It was necessary, therefore, that this result should be confirmed by experiments on animals. Such, accordingly, were soon afterwards carried out by Dr. Kempner, and yielded a result similar to that arrived at in the experiments on men. Seeing, however, that the movements of the animal might have affected the result, Dr. Kempner determined on repeating the examination with animals that had been subjected to curare. The experiments were carried out on animals with the respiratory apparatus of Prof. Zuntz. After fasting for twenty-four hours, the animals were kept, throughout the time that the experiments lasted, in exactly the same temperature—which was a warm one—and they made thirty artificial respirations per minute. The result yielded by these last experiments was that with a higher than the normal proportion of oxygen in the air breathed the consumption of oxygen was not different from that in the case of normal air. When, however, the proportion of oxygen sank to 18 per cent., the consumption of oxygen became diminished, and decreased still further in proportion as the oxygen of the air was further lessened. Similarly the amount of carbonic acid exhaled was affected by the reduced proportion of oxygen in the inspired air. Carbonic acid also decreased with the decrease of oxygen, though not in the same degree as did the consumption of oxygen, a circumstance which pointed to the fact that in the exhaled carbonic acid was contained a certain portion of this gas formed by processes of dissociation independently of the oxygen of the inhaled air. An explanation of this fact, of such high importance physiologically, that a reduced proportion of oxygen in the air inhaled was attended by a reduced consumption of oxygen, was next given by the speaker, and in conclusion he indicated a series of practical useful applications which might be made of the fact.

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